

CLAIMS

1. A method comprising:
- receiving, at a coverage frequency, a coverage signal having a coverage signal upper-sideband and a coverage signal lower-sideband;
 - forming a link signal at a link frequency, the link signal comprising a link signal upper-sideband corresponding to the coverage signal lower-sideband and a link signal lower-sideband corresponding to the coverage signal upper-sideband.
2. A method in accordance with claim 1, wherein the forming comprises:
- performing an odd number of high side injection mixing procedures to frequency shift the link coverage signal to the link frequency.
3. A method in accordance with claim 2, wherein the performing comprises:
- mixing the coverage signal with a first mixing signal to form an intermediate frequency (IF) signal; and
 - mixing the IF signal with a second mixing signal to form the link signal.
4. A method in accordance with claim 3, wherein:
- the first mixing signal has a first mixing frequency greater than the coverage frequency; and
 - the second mixing signal has a second mixing frequency less than the link frequency.
5. A method in accordance with claim 3, wherein:
- the first mixing signal has a first mixing frequency less than the coverage frequency; and

the second mixing signal has a second mixing frequency greater than the link frequency.

6. A method of forming a link signal at a link frequency from a coverage signal at a coverage frequency, the coverage signal comprising a coverage signal lower-sideband and a coverage signal upper-sideband, the method comprising:

inverting the coverage signal lower-sideband and the coverage signal upper-sideband to form the link signal comprising a link signal upper-sideband corresponding to the coverage signal lower-sideband and a link signal lower-sideband corresponding to the coverage signal upper-sideband.

7. A method in accordance with claim 6 wherein the inverting comprises:

frequency shifting the coverage signal from the coverage frequency to the link frequency.

8. A method in accordance with claim 7, wherein the frequency shifting comprises:

frequency mixing the coverage signal with a first mixing signal at a first mixing frequency to form an intermediate frequency signal at an intermediate frequency;

frequency mixing the intermediate frequency signal with a second mixing signal at a second mixing frequency greater than the link frequency if the first mixing frequency is less than coverage frequency and less than the link frequency if the first mixing frequency is greater than the coverage frequency.

9. A method in accordance with claim 7, wherein the frequency shifting further comprises filtering the intermediate frequency signal.

10. A method in accordance with claim 7, wherein the frequency shifting further comprises:

performing an odd number of high side injection frequency mixing procedures.

11. A method comprising:

receiving a coverage signal at coverage frequency, the coverage signal comprising a coverage signal lower-sideband and a coverage signal upper-sideband;

inverting a coverage signal lower-sideband and the coverage signal upper-sideband to form a link signal at a link frequency, the link signal comprising a link signal upper-sideband corresponding to the coverage signal lower-sideband and a link signal lower-sideband corresponding to the coverage signal upper-sideband; and

transmitting the link signal.

12. A method in accordance with claim 11, wherein the receiving comprises:

receiving a downstream coverage signal from a cellular base station.

13. A method in accordance with claim 12, wherein the transmitting comprises:

transmitting a downstream link signal through a wireless link channel to a distribution station configured to transmit a corresponding coverage signal to a mobile station.

14. A method in accordance with claim 11, wherein receiving the coverage signal comprises:

receiving an upstream coverage signal through a wireless coverage channel.

15. A method in accordance with claim 14, wherein the transmitting the link signal comprises:

transmitting an upstream link signal to a cellular base station.

16. A method comprising:

receiving an upstream coverage signal at an upstream coverage frequency through a wireless coverage channel from one or more mobile stations, the upstream coverage signal comprising a coverage signal upper-sideband and a coverage signal lower-sideband;

frequency shifting the upstream coverage signal from the upstream coverage frequency to the an upstream link frequency to invert the upstream coverage signal lower-sideband and the upstream coverage signal upper-sideband to form an upstream link signal at an upstream link frequency, the upstream link signal comprising an upstream link signal upper-sideband corresponding to the upstream coverage signal lower-sideband and an upstream link signal lower-sideband corresponding to the upstream coverage signal upper-sideband; and

transmitting the upstream link signal to a base station through a wireless link channel.

17. A method in accordance with claim 16, wherein the frequency shifting comprises:

frequency mixing the upstream coverage signal with a first mixing signal at a first mixing frequency to form an intermediate frequency signal at an intermediate frequency;

frequency mixing the intermediate frequency signal with a second mixing signal at a second mixing frequency greater than the upstream link frequency if the first mixing frequency is less than the upstream coverage frequency and less than the upstream link frequency if the first mixing frequency is greater than the upstream coverage frequency.

18. A method in accordance with claim 16, wherein the frequency shifting further comprises filtering the intermediate frequency signal.

19. A method in accordance with claim 16, wherein the frequency shifting further comprises:

performing an odd number of high side injection frequency mixing procedures.

20. A method in accordance with claim 16, further comprising:

receiving a downstream link signal at a downstream link frequency through the wireless link channel from the base station, the downstream link signal comprising a link signal upper-sideband and a link signal lower-sideband;

frequency shifting the downstream link signal from the downstream link frequency to a downstream coverage frequency to invert the downstream link signal lower-sideband and the downstream link signal upper-sideband to form a downstream coverage signal at a downstream coverage frequency, the downstream coverage signal comprising a downstream coverage signal upper-sideband corresponding to the downstream link signal lower-sideband and a downstream coverage signal lower-sideband corresponding to the downstream link signal upper-sideband; and

transmitting the downstream coverage signal to the mobile station through the wireless coverage channel.

21. A method in accordance with claim 17, wherein the frequency shifting the downstream link signal comprises:

frequency mixing the downstream link signal with a third mixing signal at a third mixing frequency to form another intermediate frequency signal at the intermediate frequency;

frequency mixing the another intermediate frequency signal with a fourth mixing signal at a fourth mixing frequency greater than the downstream link frequency if the third mixing frequency is less than the downstream link frequency and less than the downstream coverage frequency if the third mixing frequency is greater than the downstream link frequency.

22. A method in accordance with claim 21, wherein the frequency shifting the downstream link signal further comprises filtering the intermediate frequency signal.

23. A method in accordance with claim 21, wherein the frequency shifting the downstream link signal further comprises:

performing an odd number of high side injection frequency mixing procedures.

24. A method comprising:

receiving a downstream coverage signal at a downstream coverage frequency;

frequency mixing the downstream coverage signal with a first mixing signal having a first mixing frequency to form an intermediate frequency signal; and

forming a downstream link signal by frequency mixing the intermediate frequency signal with a second mixing signal having a second mixing frequency less than the link frequency if the first mixing signal is greater than the coverage frequency and greater than the link frequency if the second mixing frequency is less than the coverage frequency.

25. A method comprising:

receiving a downstream coverage signal at a downstream coverage frequency from a cellular base station;

forming an intermediate frequency signal having an intermediate frequency by frequency mixing the downstream coverage signal with a first mixing signal having a first mixing frequency equal to the difference between the downstream coverage signal and the intermediate frequency;

forming a downstream link signal having a downstream link frequency by frequency mixing the intermediate frequency signal with a second mixing signal having a second mixing frequency equal to the sum of the intermediate frequency and the downstream link frequency; and

transmitting the downstream link signal to a distribution station through a wireless link channel.

26. An apparatus comprising:

a first interface configured to receive a coverage signal at a coverage frequency, the coverage signal having a coverage signal lower-sideband and a coverage upper-sideband; and

a second interface configured to transmit a link signal at a link frequency and having a link signal upper-sideband corresponding to the coverage signal lower-sideband and a link signal lower-sideband corresponding to the coverage signal upper-sideband.

27. An apparatus in accordance with claim 26, further comprising:

a first mixer for frequency mixing the coverage signal with a first mixing signal having a first mixing frequency to form an intermediate frequency signal; and

a second mixer for frequency mixing the intermediate frequency signal with a second mixing signal having a second mixing frequency less than the link frequency if the first mixing signal is greater than the coverage frequency and greater than the link frequency if the second mixing frequency is less than the coverage frequency to form the link signal.

28. An apparatus comprising:

a first interface configured to receive a link signal at a link frequency, the link signal having a link signal lower-sideband and a link signal upper-sideband; and

a second interface configured to transmit a coverage signal at a coverage frequency and having a coverage signal upper-sideband corresponding to the link signal lower-sideband and a coverage signal lower-sideband corresponding to the link signal upper-sideband.

29. An apparatus in accordance with claim 28, further comprising:

a first mixer for frequency mixing the link signal with a first mixing signal having a first mixing frequency to form an intermediate frequency signal; and

a second mixer for frequency mixing the intermediate frequency signal with a second mixing signal having a second mixing frequency less than the coverage frequency if the first mixing signal is greater than the link frequency and greater than the coverage frequency if the second mixing frequency is less than the link frequency to form the coverage signal.

30. A link signal for conveying information corresponding to a wireless coverage signal exchanged with a mobile station in a cellular communication system, the link signal comprising:

a link signal upper-sideband corresponding to a coverage signal lower-sideband of the wireless coverage signal; and

a link signal lower-sideband corresponding to a coverage signal upper-sideband of the wireless coverage signal.

31. A link signal in accordance with claim 1, wherein the link signal comprises a frequency modulated carrier signal having a link frequency, the upper-

sideband spectrally located above the link frequency and the lower-sideband spectrally located below the link frequency.

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